Introduction to the Invasive Plant Species and the New Bioeconomy Symposium

The rapid expansion of the plant bioeconomy is creating strong economic incentives to distribute novel plant material, including transgenic cultivars, exotic species, and species that were formerly constrained to small geographical areas, at large geographical scales. Such introductions carry with them the risk of invasive spread of the introduced species (Simberloff and Alexander 1998). Deployment of plant species for biofuel production offers a clear example of the benefits and risks associated with the new bioeconomy (Raghu et al. 2006).

In a measure aimed at reducing U.S. dependence upon foreign petroleum reserves for energy production, President Bush announced the Advanced Energy Initiative (AEI) in his 2006 State of the Union address. This initiative provides federal funding and guidelines for the development of renewable energy sources, including plant biofuels. The objectives of the AEI, though admirable, have the potential to create a conflict with Executive Order 13112, which states that "[Federal agencies shall] not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions."

When two potential public goods, such as renewable energy and protection of ecosystems from invasive species, are in conflict, risk-benefit analysis is an important guide to action. Ecological risk analysis attempts to calculate the total risk to an ecosystem by taking into account the risk of exposure (in the case of potential invaders, this includes their survival, multiplication, and dispersal) and hazard (negative ecological effects) (Simberloff and Alexander 1998). Approaches to ecological risk analysis range from expert opinion-based qualitative methods (Raghu et al. 2006; Simberloff and Alexander 1998) to highly quantitative approaches (Caley and Kuhnert 2006).

Given the negative impacts of plant invasions, the large financial incentives to deploy biofuel species, and the potential positive role that bioenergy crops can play in offsetting the global rise in atmospheric CO_2, there is an urgent need for methods to reduce the risks of dispersing such species at landscape and regional scales. Now is the time to involve the larger community of professional weed scientists and invasion biologists in developing rigorous approaches to assessing potential risks associated with biomass crop germplasm and for managing large-scale plantings. Acting early to contain and prevent invasions is one of the key criteria for successful vegetation management. Yet there is currently very little research or outreach activity among vegetation management scientists in the area of managing biofuel plant species (DiTomaso et al. 2007). It was with this in mind that the WSSA Sustainable Agriculture Committee organized a symposium on "Invasive Plant Species and the New Bioeconomy," held at the 2008 WSSA annual meeting. The symposium focused on biofuels development as a case study for understanding the scientific issues behind plant invasions related to bioeconomy uses. Gathering the information and tools necessary for conducting risk-benefit analyses of candidate biofuel species was a unifying theme of the symposium talks.

The following symposium articles address three important aspects of the task ahead. Dr. Richard Mack, in "Evaluating the Credits and Debits of a Proposed Biofuel Species: Giant Reed (*Arundo donax*)," clearly demonstrates that concern about the possibility of biofeedstocks becoming invasive is not based on idle speculation. Dr. Roger Cousens, in "Trait-Based Models for Identifying Potential Plant Invaders: An Australian Experience," shows why plant traits alone are not sufficient for preventing the introduction of invasive plant species, instead arguing for a system of nested sieves for screening introductions. Finally, Dr. Dan Simberloff, in "Invasion Biologists and the Biofuels Boom: Cassandras or Colleagues?," makes a compelling case for fruitful collaborations between weed scientists, invasion biologists, agronomists, industry partners, and other relevant actors to develop approaches to minimize risks associated with biofuel feedstocks. We hope that these papers will inspire you to lend your talents to the effort as well.

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